DELPHI SERIES

FEATURES

- Fully integrated 3A point-of-load DC/DC converter for low component count solutions
- Small footprint and low profile : 18.6mm x 12.5mm x 4.2mm (SMD)
- Input voltage range : 7V ~ 13.2V
- 3A DC output current
- Output adjustable 0.8V to 2.5V
- Monotonic startup into normal and pre-biased loads
- Fast transient response
- Enable function
- Over current protection
- Output voltage UV/ OV protection
- Power Good
- Mositure Sensitivity Level (MSL) 3
- Lead free reflow process compatible

Integrated, Non-Isolated, Point of Load, DC/DC Power Modules: 7~13.2Vin, 0.8-2.5V/3Aout

The MCM12S03L-1A, 7V~13.2V input, single output, fully integrated non-isolated point of load DC/DC converter is the latest offering from a world leader in power systems technology and manufacturing – Delta Electronics, Inc. This product family provides up to 3A of output current or 7.5W of output power in a compact, very low profile, miniature, IC-like, molded package. It is highly integrated and requires very few external components to provide the point-of-load function. These converters hence possess outstanding electrical and thermal performance, as well as extremely high reliability under highly stressful operating conditions. Operating over the input voltage range 7V to 13.2V, the MCM12S03L-1A supports an output voltage range from 0.8V to 2.5 V, set by a single resistor. The MCM12S03L-1 A is packaged in a thermally enhanced, compact (18.6mm x 12.5mm), and low profile (4.2mm) over-molded Package suitable for automated assembly by standard surface mount equipment. The MCM12S03L-1 A is RoHS process compliant.

APPLICATIONS

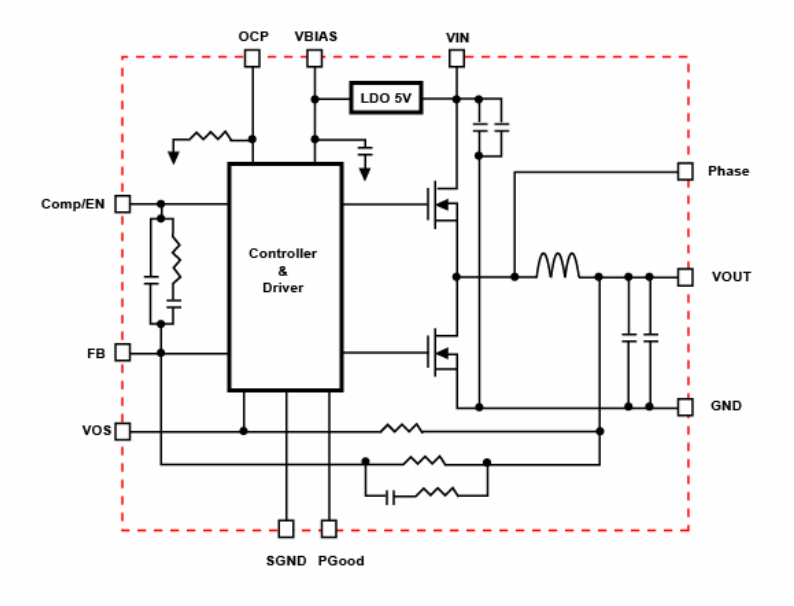
- UMPC
- Server
- Industrial PC and Equipment
- Point of Load Regulation
- Other General Purpose Step Down DC/DC

Delta Electronics, Inc.

MODEL LIST

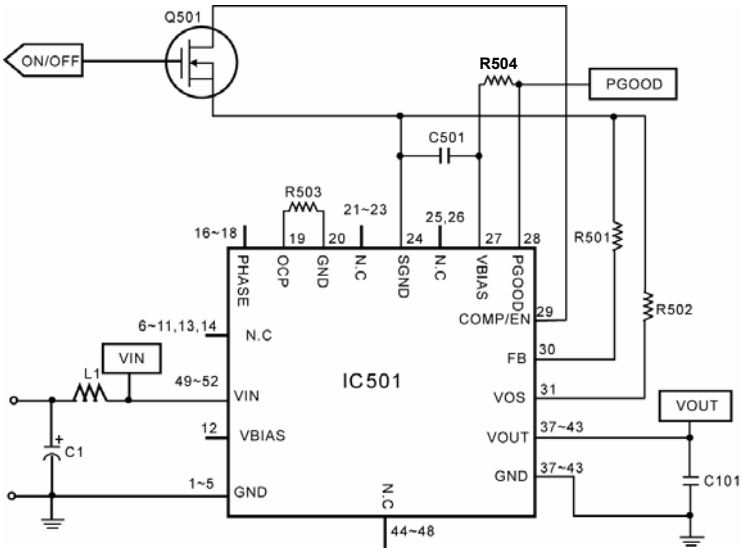
Model Name	Input Voltage	Output Voltage	Output Current	With Power Good	Efficiency 12Vin, 2.5Vo, full load
MCM12S03L A	7 ~ 13.2Vdc	0.6V ~ 2.5Vdc	3A	No	87%
MCM12S03L-1A	7 ~ 13.2Vdc	0.8V ~ 2.5Vdc	3A	Yes	87%

SIMPLIFIED BLOCK DIAGRAM



REFERENCE CIRCUITRY FOR GENERAL APPLICATION

For 7V ~ 13.2V



C1 = 470μF/25V,

L1 = 1.0μH (C1 and L1 are here to simulate the source)

R501 = trim resistor

R502 = same value as R501

R503 = OCP set resistor (leave it open then OCP set point is 6.2A typ)

R504 = 10KΩ

C501 = 0.1uF (If Vbias is not used, leave it open)

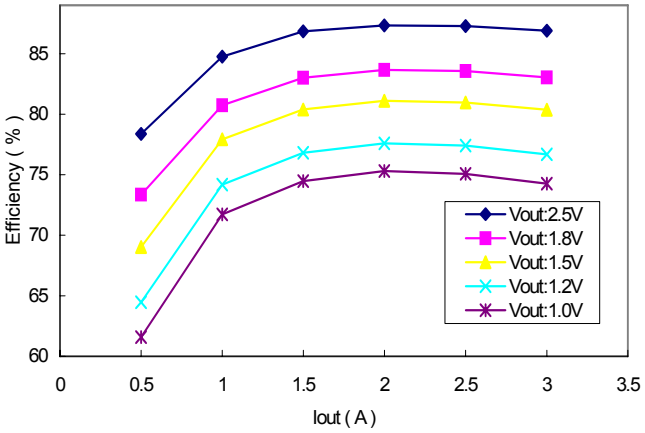
C101 = 10μF/6.3V (for Vo ripple and noise measurement)

TECHNICAL SPECIFICATIONS

T_A = 25°C, airflow rate = 300 LFM, V_{in} = 7~ 13.2Vdc, Cin=470uF/25V, Cout=10uF/6.3V, nominal Vout unless otherwise noted.

PARAMETER	NOTES and CONDITIONS	MCM12S03L-1 A			
		Min.	Typ.	Max.	Units
ABSOLUTE MAXIMUM RATINGS					
Input Voltage (Continuous)		-0.3		15	Vdc
Operating Temperature	Refer to Figure 48 for the measuring point	-40		100	°C
Storage Temperature		-40		125	°C
INPUT CHARACTERISTICS					
Operating Input Voltage		7.0	9, 12	13.2	V
Input Under-Voltage Lockout					
Turn-On Voltage Threshold	Io=Io,min	5.3	5.5	5.7	V
Hysteresis		0.3	0.35	0.4	V
Maximum Input Current	Vin=12V, Io=Io,max, Vo=2.5V		730		mA
	Vin=9V, Io=Io,max, Vo=2.5V		950		mA
	Vin=12V, Io=Io,max, Vo=1.2V		400		mA
	Vin=9V, Io=Io,max, Vo=1.2V		520		mA
No-Load Input Current	Vin=Vin,min to Vin,max, Io=Io,min		35		mA
Off Converter Input Current	Vin=Vin,min to Vin,max, Off Converter		12		mA
OUTPUT CHARACTERISTICS					
Output Voltage Set Point	Vin=12V, Io=Io,max	-1.5	Vo,set	+1.5	% Vo,set
Output Voltage Adjustable Range		0.8		2.5	V
Output Voltage Regulation	Cin=470uF/25V, Cout=10uF/6.3V				
Over Line	Vin= 7V to 13.2V		0.3		% Vo,set
Over Load	Io=Io,min to Io,max, Vin= 7V to 13.2V		0.3		% Vo,set
Over Temperature	Ta= -40℃ to 85℃		0.3		% Vo,set
Total Output Voltage Range	Over sample load, line and temperature	-2		2	% Vo,set
Output Voltage Ripple and Noise	5Hz to 20MHz bandwidth, Cout=10uF/6.3V				
Peak-to-Peak	Vin=12V, Vo and Io=min to max		20		mV
Peak-to-Peak	Vin=9V, Vo and Io=min to max		18		mV
Output Current Range		0		3	A
Output Voltage Over-shoot at Start-up	Vout=2.5V			3	% Vo,set
Output DC Current-Limit Inception	Vout =90%Vo, set		210		% Io
DYNAMIC CHARACTERISTICS					
Dynamic Load Response	2.5A/μs, Cin=470uF/25V, Cout=10uF/6.3V				
Positive Step Change in Output Current	Vin=12V, 25% to 75% Io, max		90		mVpk
Negative Step Change in Output Current	Vin=12V, 75% to 25% Io, max		90		mVpk
Positive Step Change in Output Current	Vin=9V, 25% to 75% Io, max		110		mVpk
Negative Step Change in Output Current	Vin=9V, 75% to 25% Io, max		110		mVpk
Settling Time to 10% of Peak Deviation			40		μs
Turn-On Transient	Io=1/2Io.max				
Start-Up Time, From On/Off Control	Von/off, Vo=90% of Vo,set		8		ms
Start-Up Time, From Input	Vin=Vin,min, Vo=90% of Vo,set		9		ms
Output Voltage Rise Time	Time for Vo to rise from 10% to 90% of Vo,set		3		ms
Output Capacitive Load	Full load; ESR ≧**10mΩ**			200	μF
EFFICIENCY					
Vo=2.5V	Vin=12V, Io=Io,max		87		%
Vo=1.8V	Vin=12V, Io=Io,max		83		%
Vo=1.5V	Vin=12V, Io=Io,max		80		%
Vo=1.2V	Vin=12V, Io=Io,max		76.5		%
FEATURE CHARACTERISTICS					
Switching Frequency		540	600	660	kHz
ON/OFF Control					
Logic Low Voltage	Module Off, Von/off	0.7		0.85	V
Power Good					
Logic Low Voltage				0.4	V
GENERAL SPECIFICATIONS					
MTBF	Io=80%Io, max, Ta=25℃		TBD		M hours
Weight			3		grams

ELECTRICAL CHARACTERISTICS CURVES (12V IN)



Cin = 1x 470µF/25V

Lin = 1.0µH

Cout = 1x 10µF/6.3V (for Vo ripple and noise test)

Figure 1: *Converter efficiency vs. output current at 12Vin*

12Vin Dynamic waveform

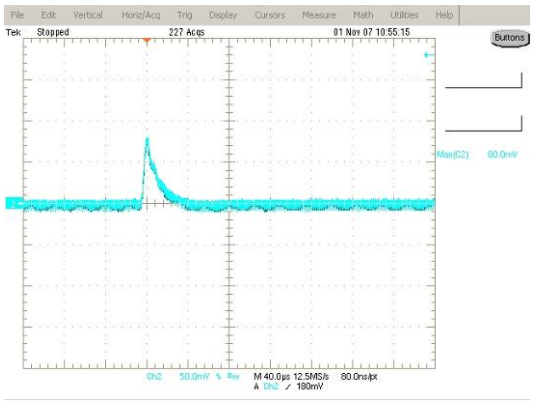


Figure 2: *Typical transient response to step load change at 2.5A/µS from 75% to 25% of Io, max at 12Vin, 2.5V out (50mV/div, 40uS/div)*

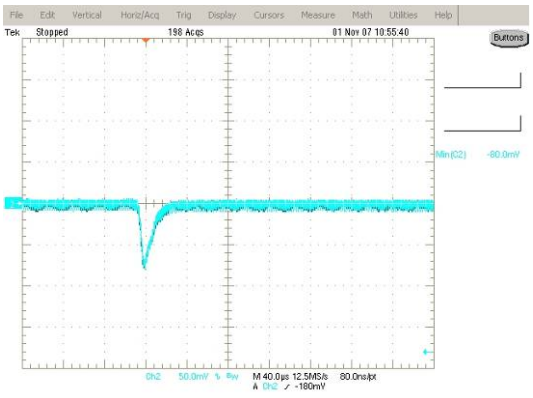


Figure 3: *Typical transient response to step load change at 2.5A/µS from 25% to 75% of Io, max at 12Vin, 2.5V out (50mV/div, 40uS/div)*

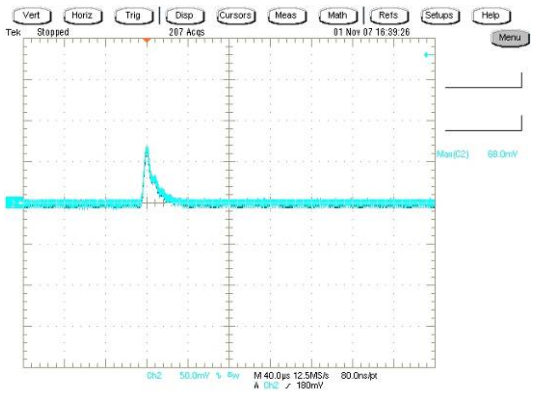


Figure 4: *Typical transient response to step load change at 2.5A/µS from 75% to 25% of Io, max at 12Vin, 1.2V out (50mV/div, 40uS/div)*

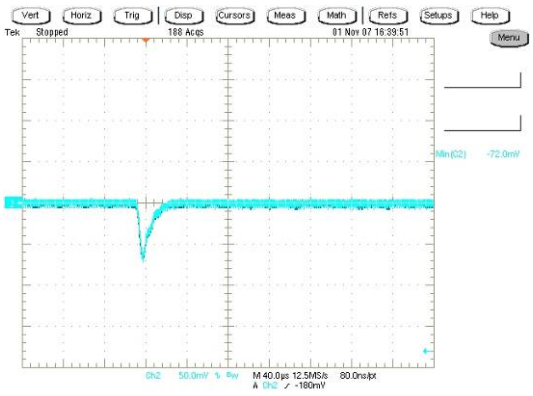


Figure 5: *Typical transient response to step load change at 2.5A/µS from 25% to 75% of Io, max at 12Vin, 1.2V out (50mV/div, 40uS/div)*

ELECTRICAL CHARACTERISTICS CURVES

12Vin Output ripple and noise waveform

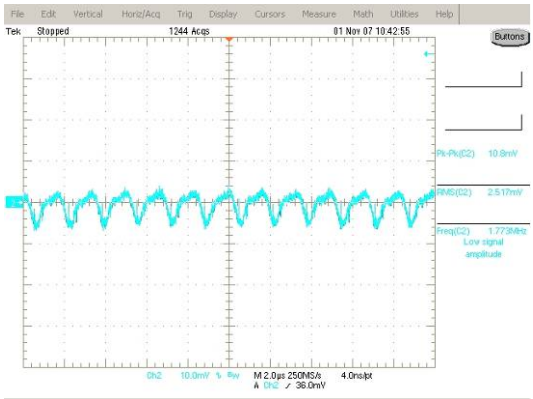


Figure 6: *Ripple & Noise: 12Vin 2.5V/3A out, 10mV/div, pk-pk : 10.8mV, rms : 2.5mV*

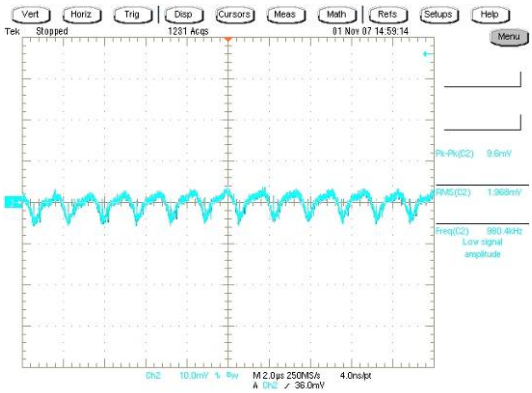


Figure 7: *Ripple & Noise: 12Vin 1.8V/3A out, 10mV/div, pk-pk : 9.6mV, rms : 1.97mV*

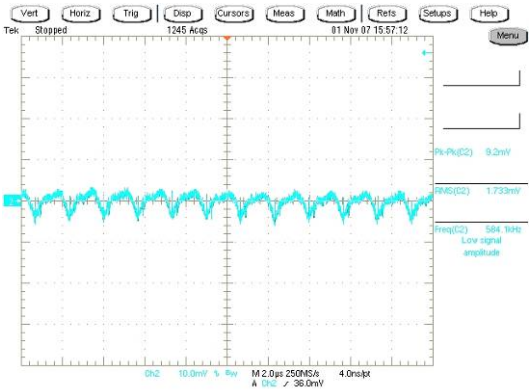


Figure 8: *Ripple & Noise: 12Vin 1.5V/3A out, 10mV/div, pk-pk : 9.2mV, rms : 1.73mV*

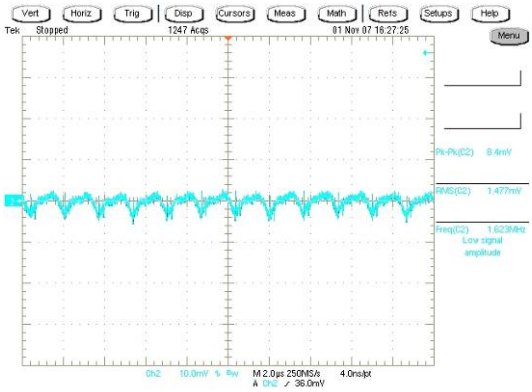


Figure 9: *Ripple & Noise: 12Vin 1.2V/3A out, 10mV/div, pk-pk : 8.4mV, rms : 1.48mV*

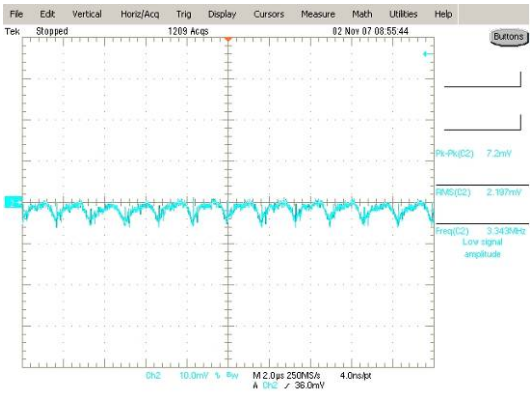


Figure 10: *Ripple & Noise: 12Vin 1.0V/3A out, 10mV/div, pk-pk : 7.2 mV, rms : 2.2mV*

ELECTRICAL CHARACTERISTICS CURVES

12Vin start-up waveform

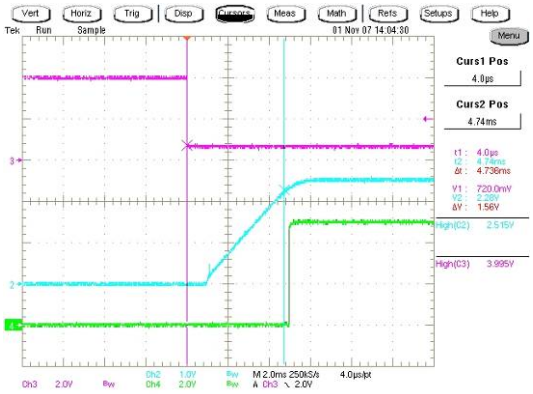


Figure 11: *Turn on delay time at 12vin, 2.5V/3A out (2mS/div); Top: on/off, 2V/div; Middle: Vout, 1V/div; Bottom: PGood, 2V/ div;*

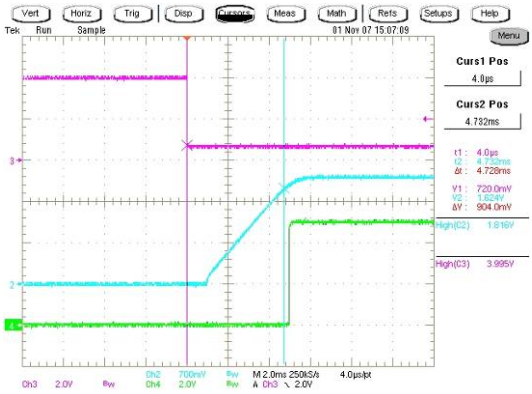


Figure 12: *Turn on delay time at 12vin, 1.8V/3A out (2mS/div); Top: on/off, 2V/div; Middle: Vout, 0.7V/div; Bottom: PGood , 2V/ div;*

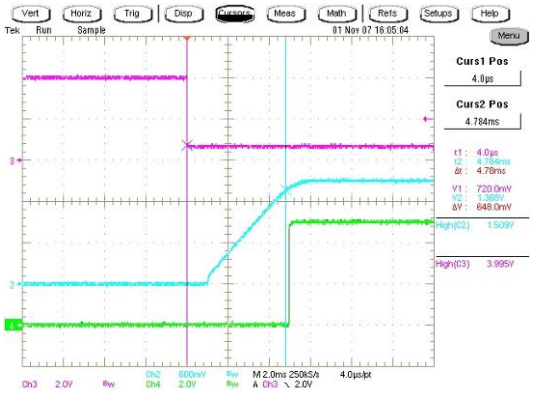


Figure 13: *Turn on delay time at 12vin, 1.5V/3A out (2mS/div); Top: on/off, 2V/div; Middle: Vout, 0.6V/div; Bottom: PGood, 2V/ div;*

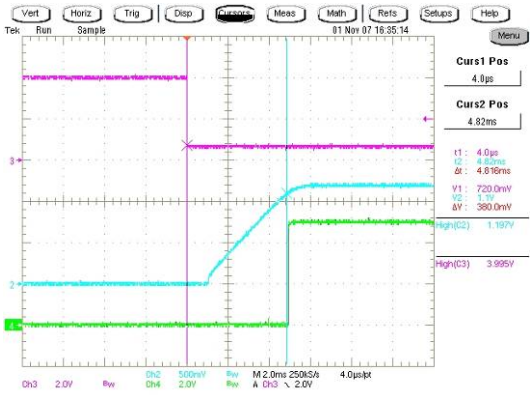


Figure 14: *Turn on delay time at 12vin, 1.2V/3A out (2mS/div); Top: on/off, 2V/div; Middle: Vout, 0.5V/div; Bottom: PGood, 2V/ div;*

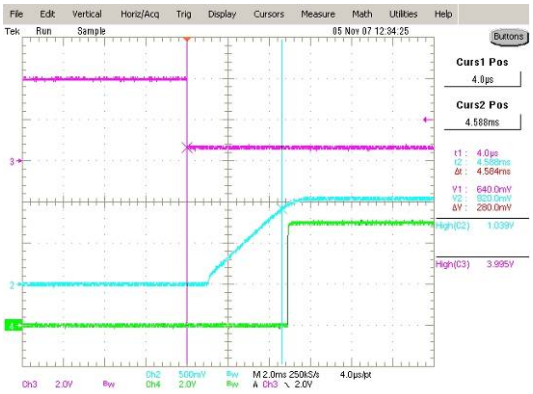
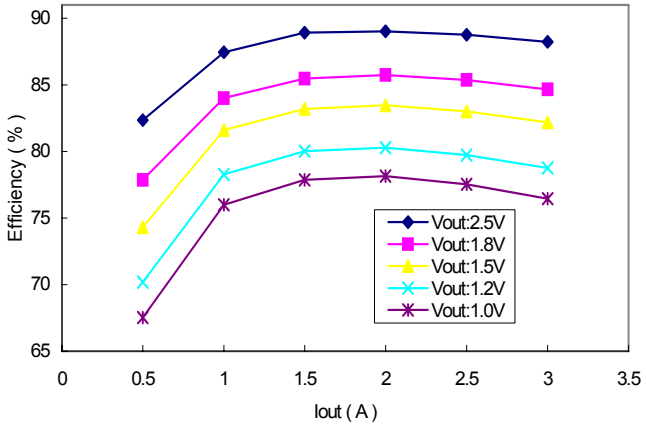


Figure 15: *Turn on delay time at 12vin, 1.0V/3A out (2mS/div); Top: on/off, 2V/div; Middle: Vout, 0.5V/div; Bottom: PGood, 2V/ div;*

ELECTRICAL CHARACTERISTICS CURVES (9V IN)



Cin = 1x 470µF/25V

Lin = 1.0µH

Cout = 1x 10µF/6.3V (for Vo ripple and noise test)

Figure 16: *Converter Efficiency vs. output current at 9Vin*

9Vin Dynamic waveform

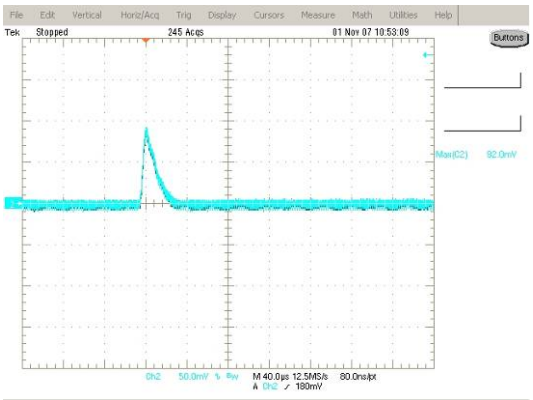


Figure 17: *Typical transient response to step load change at 2.5A/µS from 75% to 25% of Io, max at 9Vin, 2.5V out (50mV/div, 40uS/div)*

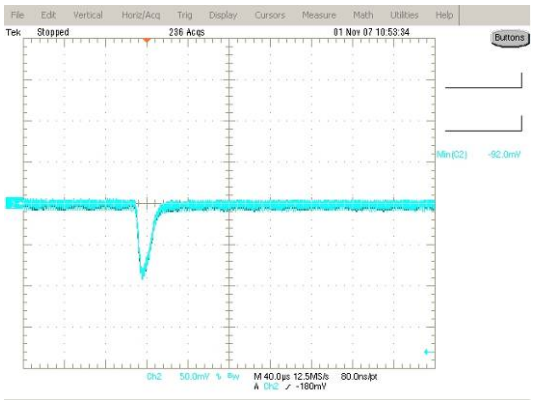


Figure 18: *Typical transient response to step load change at 2.5A/µS from 25% to 75% of Io, max at 9Vin, 2.5V out (50mV/div, 40uS/div)*

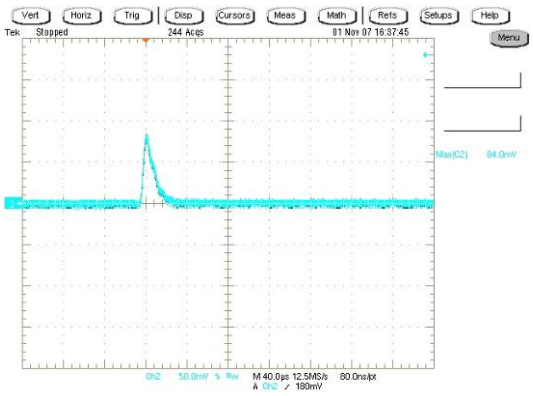


Figure 19: *Typical transient response to step load change at 2.5A/µS from 75% to 25% of Io, max at 9Vin, 1.2V out (50mV/div, 40uS/div)*

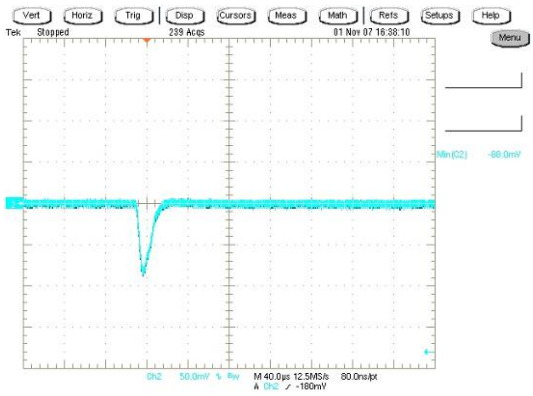


Figure 20: *Typical transient response to step load change at 2.5A/µS from 25% to 75% of Io, max at 9Vin, 1.2V out (50mV/div, 40uS/div)*

ELECTRICAL CHARACTERISTICS CURVES

9Vin output ripple and noise waveform

Figure 21: *Ripple & Noise: 9Vin 2.5V/3A out, 10mV/div, pk-pk : 9.2mV, rms : 2.3mV*

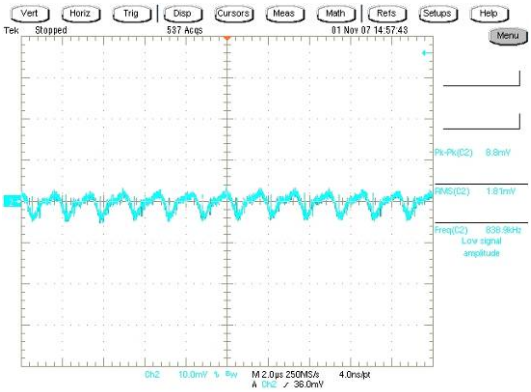


Figure 22: *Ripple & Noise: 9Vin 1.8V/3A out, 10mV/div, pk-pk : 8.8mV, rms : 1.8mV*

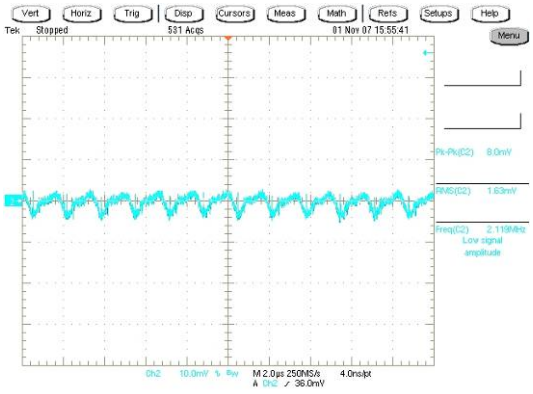


Figure 23: *Ripple & Noise: 9Vin 1.5V/3A out, 10mV/div, pk-pk : 8.0mV, rms : 1.63mV*

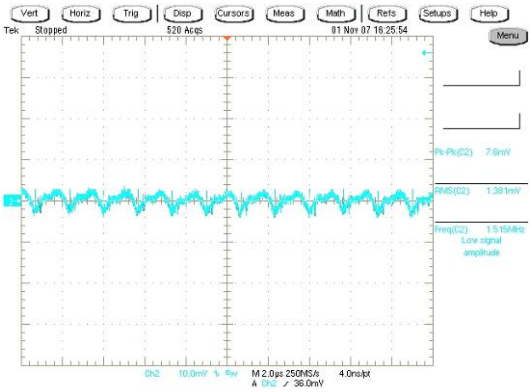


Figure 24: *Ripple & Noise: 9Vin 1.2V/3A out, 10mV/div, pk-pk : 7.6mV, rms : 1.38mV*

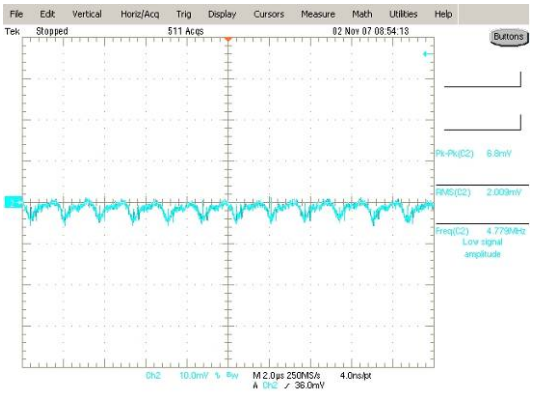


Figure 25: *Ripple & Noise: 9Vin 1.0V/3A out, 10mV/div, pk-pk : 6.8mV, rms : 2.0mV*

ELECTRICAL CHARACTERISTICS CURVES

9Vin start-up waveform

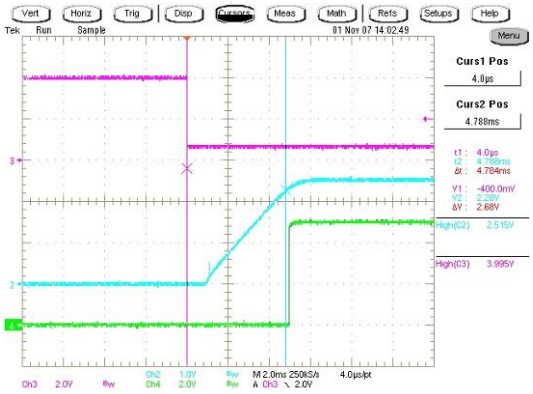


Figure 26: *Turn on delay time at 12vin, 2.5V/3A out (2mS/div); Top: on/off, 2V/div; Middle: Vout, 1.0V/div; Bottom: PGood, 2V/ div;*

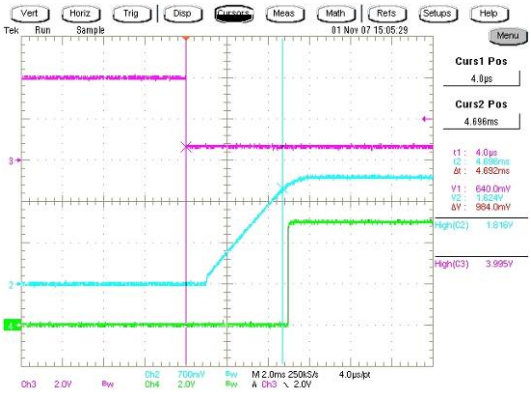


Figure 27: *Turn on delay time at 12vin, 1.8V/3A out (2mS/div); Top: on/off, 2V/div; Middle: Vout, 0.7V/div; Bottom: PGood, 2V/ div;*

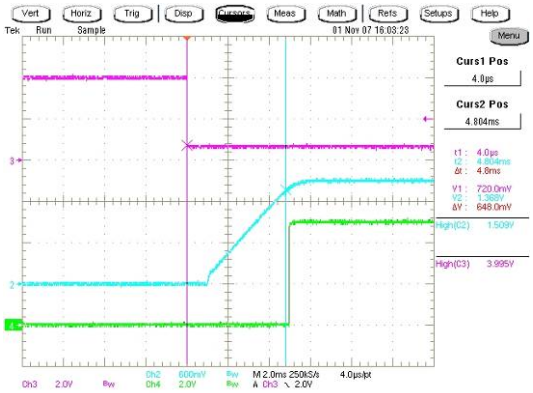


Figure 28: *Turn on delay time at 12vin, 1.5V/3A out (2mS/div); Top: on/off, 2V/div; Middle: Vout, 0.6V/div; Bottom: PGood, 2V/ div;*

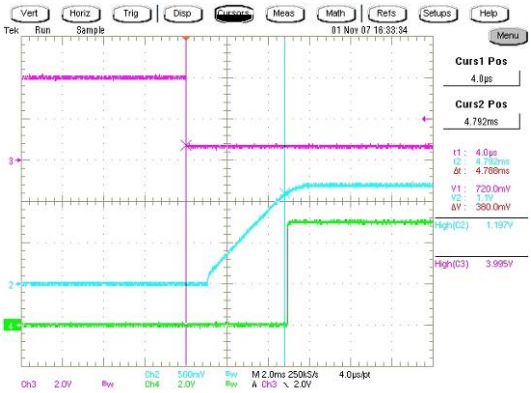


Figure 29: *Turn on delay time at 12vin, 1.2V/3A out (2mS/div); Top: on/off, 2V/div; Middle: Vout, 0.5V/div; Bottom: PGood, 2V/ div;*

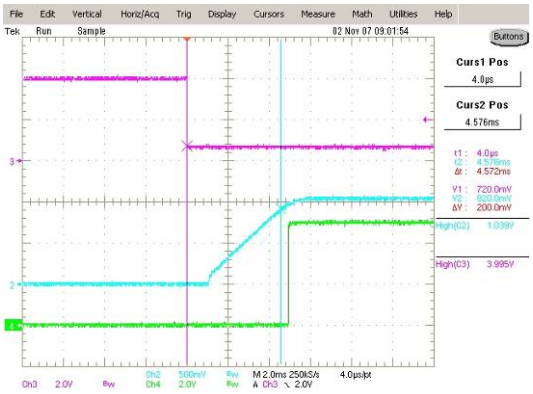


Figure 30: *Turn on delay time at 12vin, 1.0V/3A out (2mS/div); Top: on/off, 2V/div; Middle: Vout, 0.5V/div; Bottom: PGood, 2V/ div;*

DESIGN CONSIDERATIONS

The power module should be connected to a low ac-impedance input source. Highly inductive source impedances can affect the stability of the module. An input capacitance must be placed close to the modules input pins to filter ripple current and ensure module stability in the presence of inductive traces that supply the input voltage to the module.

FEATURES DESCRIPTIONS

Remote On/Off

The MCM12S03L-1 A series power modules have a Comp/EN pin for remote On/Off control.

When the Comp/EN pin is pulled below the falling threshold voltage (0.75V nominal), the MCM12S03L-1 A will be off. The external pull down device (open collector or open drain) will initially need to sink 5mA (max.) of pin output current. Once the MCM12S03L-1 A is disabled, only a 20uA current source will continue to draw current.

If the On/Off function is not used, leave the pin open and the module will be on.

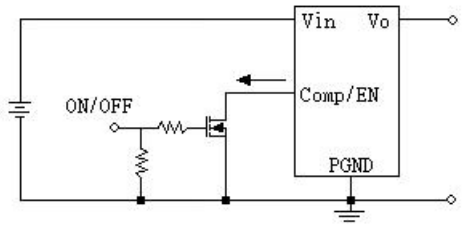


Figure 46: *Negative remote On/Off implementation*

Soft-Start

TBD

Power Good

The PGOOD function output monitors the output voltage using the same VOS pin (Pin31) and resistor divider of the under-voltage and over-voltage protection, but with separate comparators for each. The rising OV trip point (10% above 0.8V = 0.88V nominal on VOS) and the falling UV trip point (10% below 0.8V = 0.72V nominal on VOS) will trip sooner than the protection, in order to give an early warning to a possible problem. The response time of the comparators should be less than 1μs; the separate VOS input is not slowed down by the compensation on the FB pin. If the VOS pin is accidentally disconnected, a small bias current on-chip will force an over-voltage condition.

The PGOOD output is an open-drain pull-down NMOS device; it can deliver 4.0mA of sink current at 0.4V when power is NOT GOOD. A pull-up resistor to an external supply voltage sets the high level voltage when power is GOOD. The supply should be ≤6.0V, and is usually the one that powers the logic monitoring the PGOOD output. If PGOOD function is not used, the PGOOD pin can be left floating.

The PGOOD pin will be held low once VCC is above the rising POR (Power-On-Reset) trip point, and during soft-start (but if the PGOOD supply is up before or with VCC, it may be pulled high initially until the logic has enough voltage to turn on the output). Once the soft-start ramp is done (VOUT, VOS and FB should each be at 100% of their final value), the PGOOD pin will be allowed to go high, if the output voltage is within the expected window. There is no additional delay after soft-start is done.

Note that the over-current protection does directly affect the PGOOD output, before the output voltage monitoring would sense when VOUT drops 10%. The over-voltage and under-voltage protection circuits don't directly affect PGOOD, but since the PGOOD UV and OV windows are tighter, the PGOOD output should already be low by the time either protection is tripped.

Vbias Connection

Vbias pin can provide a 5V, 5mA source for the external circuit. Please add a 0.1uF cap between Vbias pin and SGND pin when this pin is used.

Over current and Short-Circuit Protection

When an OCP or SCP fault is detected, the MCM12S03L-1A over current and short circuit protection circuit will shut down the high side MOSFET and turn the low side MOSFET on, then circulating in hiccup mode. The module will remain in the hiccup mode until the EN pin is pulled below 0.75V (typ) or if the voltage at the VIN pin has fallen below the power-on reset threshold.

There is an OCP pin used to set the over current protection (OCP) and short-circuit protection (SCP) set point. MCM12S03L-1 A initial OCP set point is 6.2A (typ) when this pin is left open. Connect a resistor between the OCP pin and the PGND pin will change the OCP set point. If you would like to adjust the over-current set point to other values, please contact us.

FEATURES DESCRIPTIONS (CON.)

Output Voltage Programming

The output voltage of the MCM12S03L-1 A can be programmed to any voltage between 0.8Vdc and 2.5Vdc by connecting one resistor (Please see reference circuitry on page 2, R501) between the FB and PGND pins of the module. Without this external resistor, the output voltage of the module is 0.8Vdc.

To calculate the value of the resistor Rtrim for a particular output voltage Vo, please use the following equation:

$$R_{Trim} = 0.8 \times \frac{9.09K}{V_O - 0.8}$$

Rtrim is the external resistor in Ω
Vo is the desired output voltage

Table 1 shows the standard values of 1% R_{trim} resistor for typical output voltages：

Table 1.

R_{trim} (kΩ)	Open	36.5	18.2	10.5	7.32	4.32
Vout (V)	0.8	1.0	1.2	1.5	1.8	2.5

For example, to program the output voltage of the MCM12S10Q module to 1.8Vdc, Rtrim is calculated as follows:

$$R_{Trim} = 0.8 \times \frac{9.09K}{1.8 - 0.8}$$

Rtrim = 7.27 kΩ

The amount of power delivered by the module is the voltage at the output terminals multiplied by the output current. When using the trim feature, the output voltage of the module will be increased. At the same output current level, it would increase the output power of the module. Care should be taken to ensure that the maximum output power of the module must not exceed the maximum rated power (Vo.set x Io.max ≤ P max).

Under voltage Protection

The output is protected against undervoltage conditions by monitoring the VOS pin. An external resistor divider (similar ratio to the one on the FB pin) makes the voltage equal the 0.8V internal reference under normal operation. If the output goes too low (25% below 0.8V = 0.6V nominal on VOS), the output will latch off, with UGATE and LGATE both forced low. This requires toggling VCC (power-down and up) to restart (toggling COMP/EN will NOT restart it). The UV protection is not enabled until the end of the soft-start ramp.

When VOUT (and thus VOS) is pulled down to the 75% point, both gate drivers stop switching and the VOUT is pulled low by the disturbance, as well as the load, at a rate determine by the conditions, and the output components.

Over voltage Protection

The output is protected against overvoltage conditions by monitoring the VOS pin, similar to undervoltage. If the output goes too high (25% above 0.8V = 1.0V nominal on VOS), the output will latch off. UGATE will be forced low, but LGATE will be forced high (to try to pull-down the output) until the output drops to 1/2 of the normal voltage (50% of 0.8V = 0.4V nominal on VOS).

Overvoltage latch-off requires toggling VCC (power-down and up) to restart (toggling COMP/EN will NOT restart it). The OV protection is not enabled until the rising VCC POR trip point is exceeded.

If the VOS pin is disconnected, a small bias current on-chip will force an overvoltage condition.

FEATURES DESCRIPTIONS (CON.)

Pin Functions

COMP/EN, Pin29
The COMP/EN pin is a multiplexed pin. When the Comp/EN pin is pulled below the falling threshold voltage (0.75V normal), the MCM12S03L-1 A will be off. The external pull down device (open collector or open drain) will initially need to overcome maximum of 5mA of Pin output current. Once the MCM12S03L-1A is disabled, only a 20uA current source will continue to draw current.

PGND, Pin 1~5, 20, 32~36
Power Ground, these pins are the return path for input and output current.

VBIAS, Pin 12, 27
The VBIAS pin provides the bias voltage for the MCM12S03L-1A. It is normally connected to the VIN pin (Pin 9).

NC, Pin 6~11, 13~15, 21~23, 25~26, 44~48
These pins have no function. Please do not connect any trace to these pins.

OCP, Pin 19
The OCP pin is used to set the over current protection (OCP) and short-circuit protection (SCP) set point. MCM12S03L-1A initial OCP set point is 6.2A (typ) when this pin is left open. Connect a resistor between the OCP pin and the PGND pin will change the OCP set point.

VOS, Pin 31

This input pin monitors the regulator output for OV and UV protection, and PGOOD (OV and UV). Connect a resistor divider from VOUT to VOS to GND, with the same ratio as the FB resistor divider. It is usually not recommended to share one divider for both FB and VOS; the response to a fault may not be as quick or robust. There is a small pull-up bias current on the pin; if the VOS pin is not connected, the OV protection would be tripped to protect the load.

VIN, Pin 49~52
This pin should be tied directly to the input rail. It provides power to the MCM12S03L-1A.

PHASE, Pin 16~18
This pin connects to the source of the high side MOSFET and the drain of the low side MOSFET inside the module. This pin is used as heatsink.

Vout, Pin 37~43
Power Output Pin, it should be connected to the positive rail of the load. Apply output load between this pin and PGND pin.

FB, Pin 30
This pin is used to adjust the output voltage. Please add a resistor between the FB pin and PGND pin to set the output voltage.

PGOOD, Pin 28
This output is an open-drain pull-down device that reflects the state of the PGOOD comparators. An external pull-up resistor should be connected to a supply $\leq$6V. The output will be held low through the soft-start ramp, and is allowed to go high at the end of soft-start, if the VOS voltage is within its window. The PGOOD window is tighter than the OV or UV protection window, so it may give an early warning of a problem. The PGOOD does respond directly to an OCP condition, but may also go low if VOUT drops low enough before an OCP trip.

SGND, Pin 24
Signal Ground, this pin is the return path for signal.

THERMAL CONSIDERATIONS

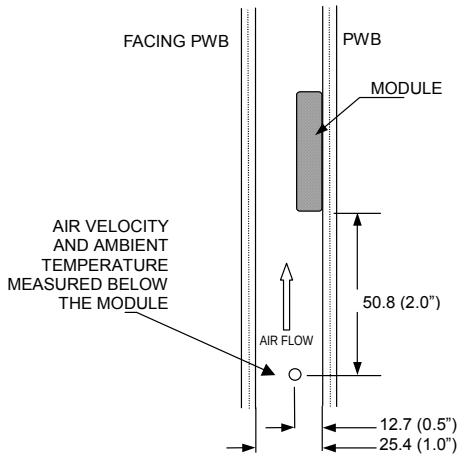
Thermal management is an important part of the system design. To ensure proper, reliable operation, sufficient cooling of the power module is needed over the entire temperature range of the module. Convection cooling is usually the dominant mode of heat transfer.

Hence, the choice of equipment to characterize the thermal performance of the power module is a wind tunnel.

Thermal Testing Setup

Delta's DC/DC power modules are characterized in heated vertical wind tunnels that simulate the thermal environments encountered in most electronics equipment. This type of equipment commonly uses vertically mounted circuit cards in cabinet racks in which the power modules are mounted.

The following figure shows the wind tunnel characterization setup. The power module is mounted on a test PWB and is vertically positioned within the wind tunnel. The height of this fan duct is constantly kept at 25.4mm (1'').



Note: Wind Tunnel Test Setup Figure Dimensions are in millimeters and (Inches)

Figure 47: *Wind tunnel test setup*

Heat can be removed by increasing airflow over the module. To enhance system reliability, the power module should always be operated below the maximum operating temperature. If the temperature exceeds the maximum module temperature, reliability of the unit may be affected.

Thermal performance shown as below is based on the test board with minimum copper traces area (worst condition). The test board is 1oz / 4 layers.

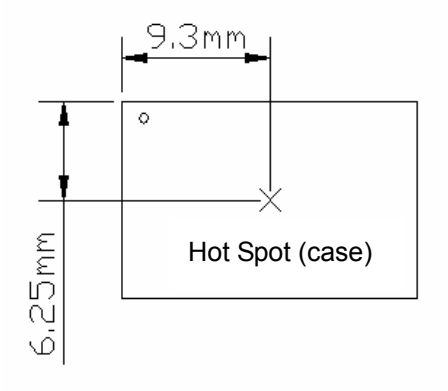


Figure 48: *Temperature measurement location*

The max. allowed temperature of hot spot is defined at 100℃

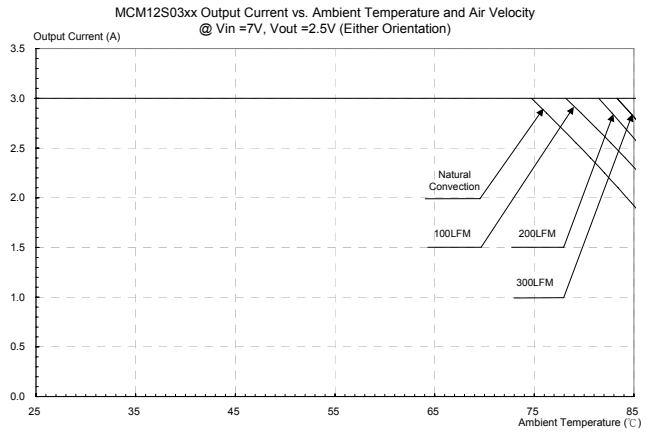


Figure 49: *Output current vs. ambient temperature and air velocity@ Vin=7V, Vo=2.5V(Either Orientation)*

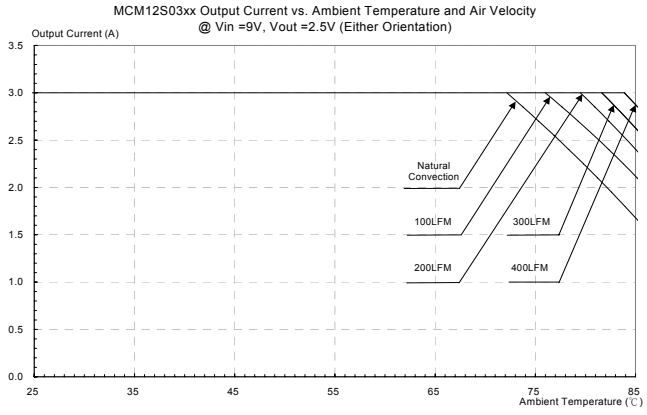


Figure 50: *Output current vs. ambient temperature and air velocity@ Vin=9V, Vo=2.5V(Either Orientation)*

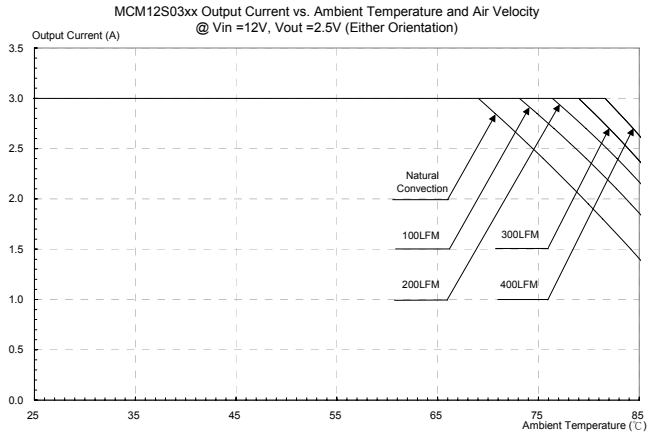
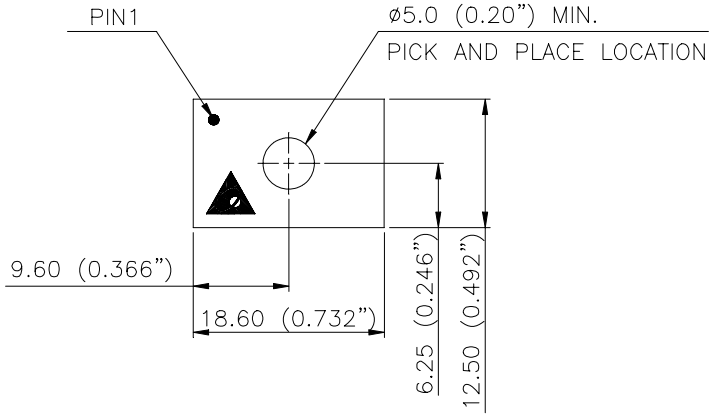


Figure 51: *Output current vs. ambient temperature and air velocity@ Vin=12V, Vo=2.5V(Either Orientation)*

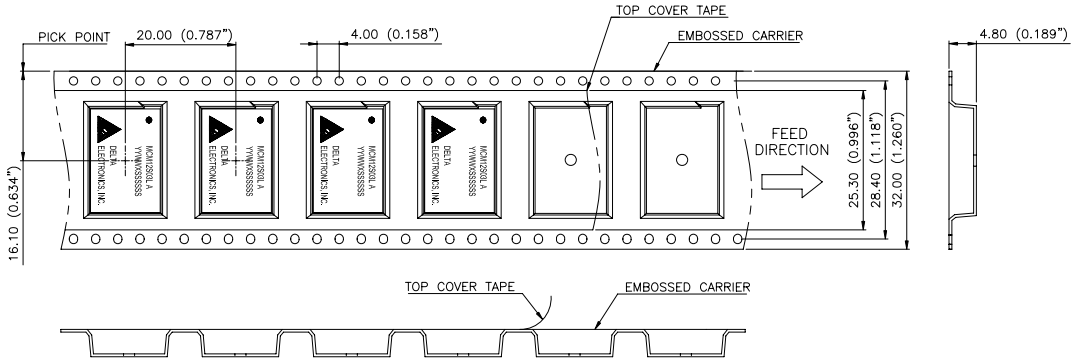
PICK AND PLACE LOCATION

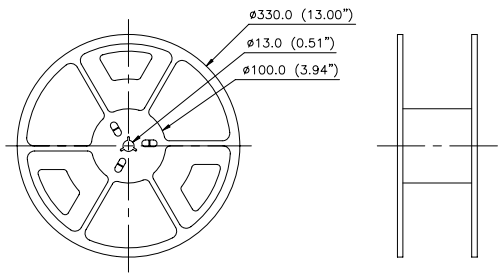


NOTES:
ALL DIMENSIONS ARE IN MILLIMETERS AND (INCHES)
TOLERANCES: X.Xmm±0.5mm(X.XX in.±0.02 in.)
X.XXmm±0.25mm(X.XXX in.±0.010 in.)

SURFACE- MOUNT TAPE & REEL

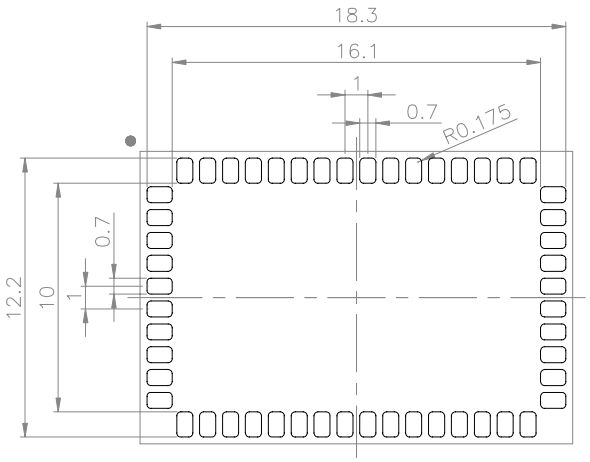
[Dimensions are in millimeters (mm)]



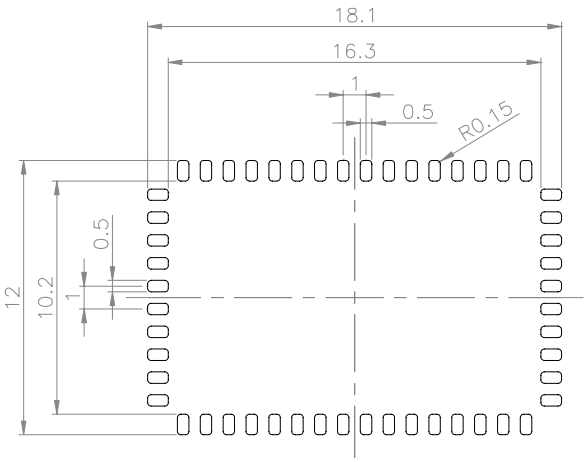


RECOMMENDED PWB PAD LAYOUT

Recommend Footprint：

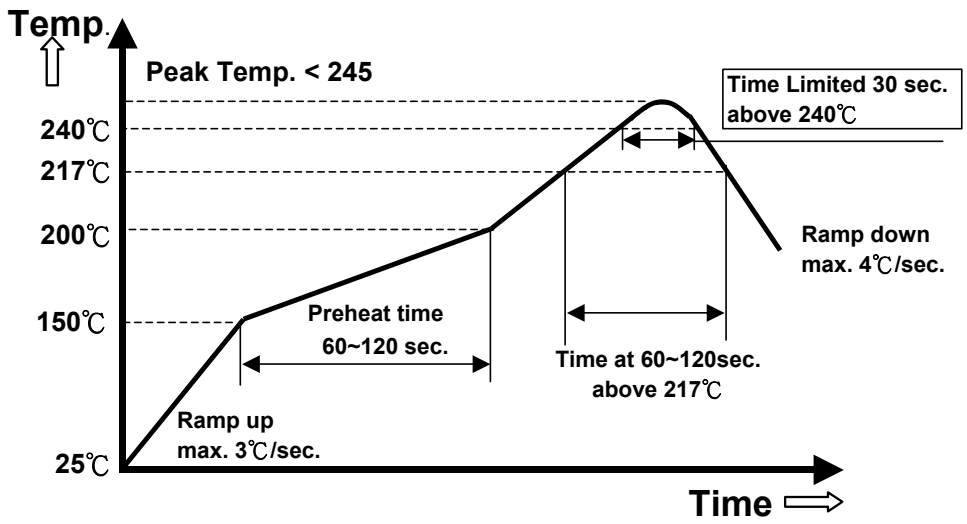


Recommend Stencil：



[Dimensions are in millimeters (mm)]

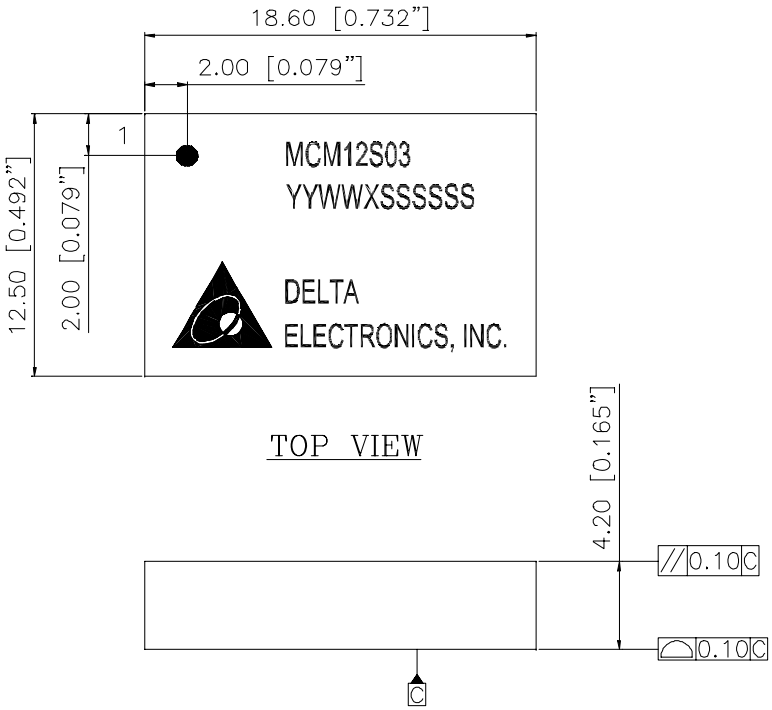
LEAD FREE (SAC) PROCESS RECOMMEND TEMPERATURE PROFILE



Note: 1. All temperature refers to assembly application board, measured on the land of assembly application board.

2. Peak temperature measured on topside surface of device no higher than 245℃

MECHANICAL DRAWING



NOTES:
1.DIMENSIONS ARE IN MILLIMETERS AND (INCHES)
2.TOLERANCES: X.Xmm±0.5mm(X.XX in.±0.02 in.)
X.XXmm±0.25mm(X.XXX in.±0.010 in.)

Pin Description

Pin	Symbol	Description	Pin	Symbol	Description
1	GND	Power GND	27	Vbias	Bias supply
2	GND	Power GND	28	PGOOD	Power Good
3	GND	Power GND	29	Comp/EN	Dual function, E/A output and enable module
4	GND	Power GND	30	FB	Feedback Input
5	GND	Power GND	31	Vos	Output Voltage Sense
6	N.C		32	GND	Power GND
7	N.C		33	GND	Power GND
8	N.C		34	GND	Power GND
9	N.C		35	GND	Power GND
10	N.C		36	GND	Power GND
11	N.C		37	VOUT	Output Voltage
12	Vbias	Bias supply	38	VOUT	Output Voltage
13	N.C		39	VOUT	Output Voltage
14	N.C		40	VOUT	Output Voltage
15	N.C		41	VOUT	Output Voltage
16	Phase	Phase node	42	VOUT	Output Voltage
17	Phase	Phase node	43	VOUT	Output Voltage
18	Phase	Phase node	44	N.C	
19	OCP	OCP set point	45	N.C	
20	GND	Power GND	46	N.C	
21	N.C		47	N.C	
22	N.C		48	N.C	
23	N.C		49	VIN	Input Voltage
24	SGND	Signal GND	50	VIN	Input Voltage
25	N.C		51	VIN	Input Voltage
26	N.C		52	VIN	Input Voltage

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